

# Question Paper

Exam Date & Time: 23-Apr-2022 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER M.Sc. NMT DEGREE EXAMINATION - APRIL 2022  
SUBJECT: NMT5101 - PHYSICS AND DOSIMETRY IN NUCLEAR MEDICINE  
(2021 SCHEME)

Answer ALL questions.

Marks: 100

Duration: 180 mins.

- 1) Define radioactivity. Derive a relationship between radioactivity and time. (20)
- 2) Explain MIRD method of dosimetry. (20)
- 3A) Find the counts at pixel3 ( $p_3$ ) by using Newton's interpolation formula. Data are given below: (10)

Pixel no.	2	4	6	8	10	12
Counts	120k	140k	150k	180k	190k	200k

- 3B) Find the inverse of square matrix  $A = \begin{bmatrix} 1 & -3 & -1 \\ 2 & 4 & 5 \\ -3 & 2 & -2 \end{bmatrix}$  (10)

- 3C) Discuss in detail photoelectric and Compton effect. (10)

- 3D) Discuss the working of a gas filled radiation detector. (10)

- 4A) Solve  $\frac{(\cos 6\theta + i \sin 6\theta)^5 (\cos 5\theta - i \sin 5\theta)^3}{(\cos 3\theta + i \sin 3\theta)^2 (\cos 6\theta - i \sin 6\theta)^4}$  (5)

- 4B) Deduce the appropriate compartment model. (5)

$$\begin{aligned} dV_1/dt &= k_{01}V_0 + k_{21}V_2 + k_{41}V_4 - k_{12}V_1 - k_{14}V_1 \\ dV_2/dt &= k_{12}V_1 - k_{21}V_2 - k_{23}V_2; & dV_3/dt &= k_{23}V_2 - k_{30}V_3; \\ dV_4/dt &= k_{14}V_1 - k_{41}V_4 - k_{45}V_4; & dV_5/dt &= k_{45}V_4 - k_{50}V_5 \end{aligned}$$

- 4C) Explain Zener diode. (5)

- 4D) Write a short note on neutron cross section. (5)

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# Question Paper

Exam Date & Time: 22-Apr-2022 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER M.Sc. NMT DEGREE EXAMINATION - APRIL 2022  
SUBJECT: NMT5102 - RADIOPHARMACY AND RADIOPHARMACEUTICALS IN NUCLEAR MEDICINE  
(2021 SCHEME)

Marks: 100

Duration: 180 mins.

Answer all the questions.

- 1) Describe the various stages of radiopharmaceutical discovery and development. (20)
- 2) Describe about the design, construction and working principles of Tc-99m generator and quality control of its eluate. (20)
- 3A) Describe the nucleophilic synthesis process for F-18 FDG (10)
- 3B) Describe in detail the ideal characteristics of therapeutic and diagnostic radio-pharmaceuticals. (10)
- 3C) Describe the quality control tests for PET radiopharmaceuticals. (10)
- 3D) Describe the various tissue uptake mechanisms for radiopharmaceuticals. (10)
- 4A) Write short notes on synovectomy. (5)
- 4B) Draw a label diagram of Ga-68 generator (5)
- 4C) Describe briefly any three electrophilic substitution methods used in radio-iodination process (5)
- 4D) What are the safety measures to be adopted during preparation and administration of PET radiotracers (5)

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